National Weather Service, Elko

The Great Basin: Spotter Newsletter

Spring/Summer 2005 Edition

What's Inside

Meteorologist-in-Charge says: Thank you!

By: Kevin Baker

After a wet winter for much of northern and central Nevada, I wish to thank all of our weather spotters and observers for their contribution to our weather warning program. We issued many winter storm warnings this winter, and your help in verifying these events was critical to evaluation of the warning program. In addition, your weather reports were included in our daily Regional Temperature and Precipitation summaries or Local Storm Reports, and were relayed to the media and other customers.

One of the best ways to view weather observations and forecasts is through our web page at "www.weather.gov/Elko". If you have any questions about using the web site, contact our webmaster (Greg Lonien) at 775-778-6716.

As we prepare for the summer season, I wish to thank all of you for your assistance and support of NOAA's National Weather Service programs over the past winter.

Winter Weather Summary

By: Clifford Collins
(Lead Forecaster)

A weak to moderate El Nino caused the storm track to take a more southerly route than normal this past winter. This resulted in above normal precipitation for all but far northern and northwest Nevada. Central Nevada averaged 175 percent of normal precipitation, northeast Nevada 145 percent of normal, with northwest Nevada coming in at 77 percent of normal. Eureka took top honors for the most precipitation with 4.43 inches for the period December through February. Dufurrena was the driest with only 0.97 inches of precipitation which was only 51 percent of normal. Snowfall was also significantly above normal in many locations. Elko received 49.8 inches which was 217 percent of normal, Ely 30.4 inches which was 135 percent of normal. Even Winnemucca received more snow than normal, coming in at 17.2 inches which was 134 percent of normal. This occurred even though precipitation as a whole was below normal. This was due to the fact that temperatures averaged 2.4 degrees below normal across the north so more of the precipitation fell as snow than usual. Central Nevada averaged 2.1 degrees above normal. The above normal precipitation and snowfall also resulted in more fog than usual. Elko reported 21 days of heavy fog, defined as visibility reduced to ¼ mile or less. The normal number of days is 7. Winnemucca had 17 days of heavy fog compared to a normal of 5 days. Ely had 13 days of heavy fog compared to a normal of 3 days.

Flooding Nevada

By: Larry Whitworth
(Lead Forecaster)

It doesn't happen often but rivers and streams around Northern and Central Nevada during Spring 2005 ran stronger than they have in a long while. With snow-melt still being realized in the flows, this is a year to remember, brought to you by El Nino. There are positive and negative impacts when an overabundance of precipitation and residual runoff occur in an area with a normally arid climate.

El Nino, the shift in ocean temperatures and atmospheric conditions in the tropical Pacific Ocean that disrupts weather around the world, created conditions that allowed a lot of moisture to move in from the Pacific and into the Western United States this year. Significant winter snowfall across Northern Nevada and abundant precipitation in the form of rain and snow that occurred in April and May of this year led to flooding along the Humboldt River and some smaller streams in Northern Nevada. Some typically dry streambeds were even flowing strong this spring.

There are some benefits to the high water flows, as you can imagine. Field irrigation is maximized when water is diverted from river and stream channels spreading fresh nutrients. Reservoirs can refill to higher levels than prior years when drought has been a problem. And we can always hope that public water restrictions will be minimized this year.

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There is also a downside to high flows. Flooding creates concern for commerce. During large flood events the morphology of the river or stream changes. Growth in Riparian areas are affected by high flows. As the erosive power of the water increases, so does the sediment transport rate, which in turn changes the morphology, or shape, of the river or stream channel. Some roads near the river may become impassable affecting businesses and posing a threat to livestock. A change in morphology can pose a challenge in forecasting future flooding problems as the river channel may be deeper or wider in some sections, or may even have changed its path.

Riparian areas, lush vegetation that grows alongside river and stream channels, represent a tiny fraction of the total land area in Nevada but provide more vegetation per acre than any other part of the landscape. Riparian areas can serve as water quality protection, flood control and storm damage prevention. They are also biodiversity habitats. Water is a mechanism for the spread of invasive weeds. Flood flows act to transport seeds and plant parts. As flows recede, plant matter is deposited on newly formed sandbars and in areas stripped clear of vegetation. Species which are favored by disturbance and by newly mobilized dissolved nutrients will rapidly fill these niches.

High flows of water in Spring in a dry climate region can have positive and negative impacts. El Nino years seem to bring much more water to Northern Nevada than a typical year. Spring 2005 will be remembered for allowing us to forget, for a short time at least, that we are in a desert.

Figure 1. **Flooding in Deeth on May 21st 2005**

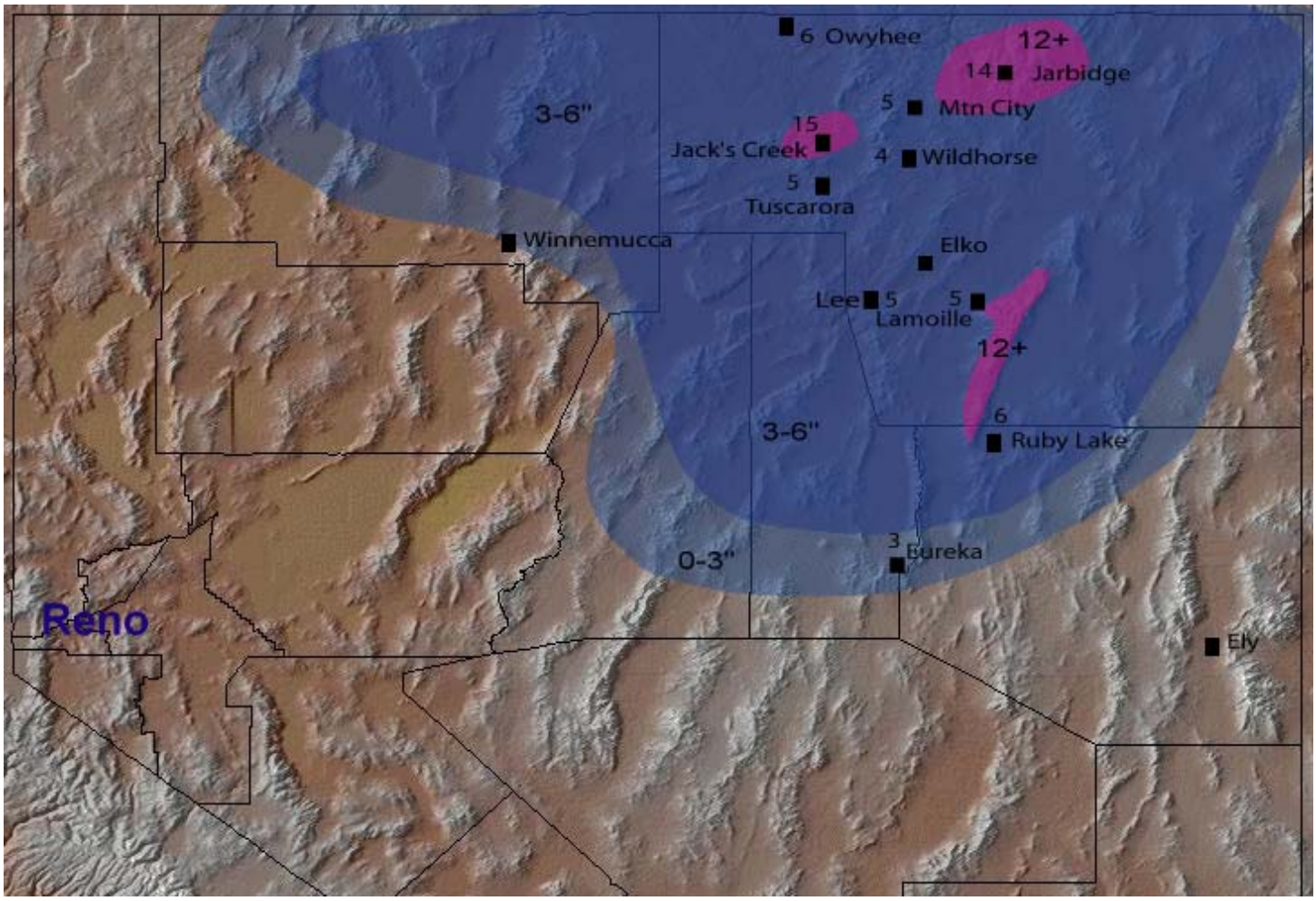
NOAA's National Weather Service web pages change for the better.

By:Jeff Rood
(General Forecaster)

In an ongoing effort to provide the public with useful and timely weather information, NWS web pages are constantly changing. The national level web page for the NWS can be found at http://www.weather.gov/. This site provides users with (among other information) a clickable map of the United States with all current weather advisory, watch, and warning information. By placing your cursor over a specific part of the country and clicking, you are quickly transferred to the nearest NWS office web page to that point, which will provide localized weather information. Once transferred to the local site, users will be able to see a list of all "local news and information" at the top of the page. This section is a great place to find out what's new on that particular offices web page.

Your Elko office web page is no exception, with one of the most exciting new improvements being the introduction of snowfall accumulation maps. These maps are produced after each significant snow event. Maps (such as in figure 2) are usually available within 24 hours of a major snow storms conclusion. The map below (along with all of the Great Basin Winter 2005 snow maps) can be found on the Elko Nevada NWS web page at http://www.weather.gov/elko by clicking on the "snowfall maps" link.

Figure 2. **Snowfall Map from the April 20 storm**



Lightning and Lightning Safety

By: Jeff Rood
(General Forecaster)

With summer and the convective weather season approaching, lightning becomes a concern in Nevada. Most people know that lightning causes many wildfires every summer, however many people are surprised to learn just how many people get struck by lightning each year in the United States. Below are some facts and safety information provided by NOAA. More information on lightning, and the fourth annual Lightning Safety Awareness Week (June 19-25), can be found by logging onto the Internet and going to http://www.noaa.gov/lightning.html.

How Powerful is Lightning?

Each spark of lightning can reach over five miles in length, soar to temperatures of approximately 50,000 degrees Fahrenheit, and contain 100 million electrical volts.

Lightning Is A Random, Chaotic And Dangerous Fact Of Nature

At any given moment, there are 1,800 thunderstorms in progress somewhere on the earth. This amounts to 16 million storms each year! Scientists that study lightning have a better understanding today of the process that produces lightning, but there is still more to learn about the role of solar flares on the upper atmosphere, the earth's electromagnetic field, and ice in storms. We know the cloud conditions needed to produce lightning, but cannot forecast the location or time of the next stroke of lightning. There are lightning detection systems in the United States and they monitor an average of 25 million strokes of lightning from the cloud to ground every year!

Lightning has been seen in volcanic eruptions, extremely intense forest fires, surface nuclear detonations, heavy snowstorms, and in large hurricanes, however, it is most often seen in thunderstorms. A thunderstorm forms in air that has three components: moisture, instability and something such as a cold front to cause the air to rise. Continued rising motions within the storm may build the cloud to a height of 35,000 to 60,000 feet (6 to 10 miles) above sea level. Temperatures higher in the atmosphere are colder; ice forms in the higher parts of the cloud.

Ice In The Cloud Is Critical To The Lightning Process

Ice in a cloud seems to be a key element in the development of lightning. Storms that fail to produce quantities of ice may also fail to produce lightning. In a storm, the ice particles vary in size from small ice crystals to larger hailstones, but in the rising and sinking motions within the storm there are a lot of collisions between the particles. This causes a separation of electrical charges. Positively charged ice crystals rise to the top of the thunderstorm, and negatively charged ice particles and hailstones drop to the middle and lower parts of the storm. Enormous charge differences (electrical differential) develops.

How Lightning Develops Between The Cloud And The Ground

A moving thunderstorm gathers another pool of positively charged particles along the ground that travel with the storm. As the differences in charges continue to increase, positively charged particles rise up taller objects such as trees, houses, and telephone poles. Have you ever been under a storm and had your hair stand up? Yes, the particles also can move up you! This is one of nature's warning signs that says you are in the wrong place, and you may be a lightning target!

The negatively charged area in the storm will send out a charge toward the ground called a stepped leader. It is invisible to the human eye, and moves in steps in less than a second toward the ground. When it gets close to the ground, it is attracted by all these positively charged objects, and a channel develops. You see the electrical transfer in this channel as lightning. There may be several return strokes of electricity within the established channel that you will see as flickering lightning.

Thunder
The lightning channel heats rapidly to 50,000 degrees. The rapid expansion of heated air causes the thunder. Since light travels faster than sound in the atmosphere, the sound will be heard after the lightning. If you see lightning and hear thunder at the same time, that lightning is in your neighborhood!

Negative Lightning And Positive Lightning
Not all lightning forms in the negatively charged area low in the thunderstorm cloud. Some lightning originates in the cirrus anvil at the top of the thunderstorm. This area carries a large positive charge. Lightning from this area is called positive lightning. This type is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm, in areas that most people do not consider to be a lightning risk area. The other problem with positive lightning is it typically has a longer duration, so fires are more easily ignited. Positive lightning usually carries a high peak electrical current, which increases the lightning risk to an individual.

Lightning—The Underrated Killer
In the United States, there are an estimated 25 million cloud-to-ground lightning flashes each year. Lightning can be fascinating to watch, but it is also extremely dangerous. During the past 30 years, lightning killed an average of 67 people per year in the United States based on documented cases. This is more than the average of 65 deaths per year caused by tornadoes and the average of 16 deaths per year caused by hurricanes. However, because lightning usually claims only one or two victims at a time, and because lightning does not cause the mass destruction left in the wake of tornadoes or hurricanes, lightning generally receives much less attention than the more destructive weather-related killers. While documented lightning injuries in the United States average about 300 per year, undocumented injuries caused by lightning are likely much higher.

Watch for Developing Thunderstorms
Thunderstorms are most likely to develop on warm summer days and go through various stages of growth, development and dissipation. On a sunny day, as the sun heats the air, pockets of warmer air start to rise in the atmosphere. When this air reaches a certain level in the atmosphere, cumulus clouds start to form. Continued heating can cause these clouds to grow vertically upward in the atmosphere into "towering cumulus" clouds. These towering cumulus may be one of the first indications of a developing thunderstorm.

The 30-30 Rule
Use the 30-30 rule where visibilty is good and there is nothing obstructing your view of the thunderstorm. When you see lightning, count the time until you hear thunder. If that time is 30 seconds or less, the thunderstorm is within 6 miles of you and is dangerous. Seek shelter immediately. The threat of lightning continues for much longer period than most people realize. Wait at least 30 minutes after the last clap of thunder before leaving shelter. Don't be fooled by sunshine or blue sky!

If it is cloudy or objects are obscuring your vision, get inside immediately. It is always safer to take precautions than to wait.

Outdoor Activities: Minimize the Risk of Being Struck

Most lightning deaths and injuries in the United States occur during the summer months when the combination of lightning and outdoor summertime activities reaches a peak. During the summer, people take advantage of the warm weather to enjoy a multitude of outdoor recreational activities. Unfortunately, those outdoor recreational activities can put them at greater risk of being struck by lightning. People involved in activities such as boating, swimming, fishing, bicycling, golfing, jogging, walking, hiking, camping, or working out of doors all need to take the appropriate actions in a timely manner when thunderstorms approach. Where organized sports activities take place, coaches, umpires, referees, or camp counselors must protect the safety of the participants by stopping the activities sooner, so that the participants and spectators can get to a safe place before the lightning threat becomes significant. To reduce the threat of death or injury, those in charge of organized outdoor activities should develop and follow a plan to keep participants and spectators safe from lightning.

Indoor Activities: Things to Avoid
Inside homes, people must also avoid activities which put their lives at risk from a possible lightning strike. As with the outdoor activities, these activities should be avoided before, during, and after storms. In particular, people should stay away from windows and doors and avoid contact with anything that conducts electricity. People may also want to take certain actions well before the storm to protect property within their homes, such as electronic equipment.

Summary
Lightning is a dangerous threat to people in the United States, particularly those outside in the summer. With common sense, we can greatly reduce the number of lightning deaths. When thunderstorms threaten, get to a safe place, stay there longer than you think you need to, stay away from windows and doors and avoid contact with anything that conducts electricity.

DataStreme Atmosphere in Elko

By: Ian Morrison (General Forecaster)

DataStreme Atmosphere is a major precollege teacher enhancement initiative of the American Meteorological Society (AMS), supported by the National Oceanic and Atmospheric Administration (NOAA). Its main goal is the training of Weather Education Resource Teachers who will promote the teaching of science, mathematics and technology using weather as a vehicle, across the K-12 curriculum in their home school districts.

The initial step in the training of Resource Teachers is their participation in the DataStreme Atmosphere distance-learning course. The 13-week course is offered twice a year to selected participants. It focuses on the study of the atmospheric environment using electronically transmitted weather data and learning materials combined with Study Guide readings and investigations. Teachers successfully completing the course will receive 3 semester hour graduate credits from the State University of New York at Brockport. The course also requires three group meetings that will be facilitated by the National Weather Service Office in Elko. The first course for the Elko region will begin in August with participating teachers from around the area.

Who can participate in DataStreme Atmosphere?

Participants must be teaching professionals at the precollege level who live in an area served by a Local Implementation Team (LIT). Teachers of any grade level or subject who have an interest in promoting the teaching of weather across the curriculum may apply. Many participants are earth science, middle school and upper elementary teachers. Applications are sought from persons who can demonstrate potential for leadership as resource teachers. They must be willing to act as resource persons for other teachers and as advocates for promoting the use of electronically delivered environmental data in schools.

Teachers who are members of groups traditionally under-represented in the sciences, or teachers who are teaching in schools with large numbers of students from groups traditionally under-represented in the sciences, are especially urged to apply.

Elko Outreach Team gets the word out!

By: Roham Abtahi (Meteorologist)

NWS Elko has been actively pursuing outreach events since the formation of the office outreach team earlier this year. With the Elko CWFA (county warning forecast area) having such sparse population, the outreach team has been creatively searching for ways to inform the public on NWS products and services. One example was a trip in early March to the Native Duck River Valley Reservation town of Owyhee's Career Fair. Displays related to weather safety and were provided to the public. Students attending the fair had the opportunity to find out what working for the NWS is like, the classes they would need to take to get into a meteorology program in college, the rewards for providing the public with weather information.

NWS Elko has also been focusing on communication with various charitable organizations in the area including presentations given to the Shriner's Club and Elko Rotary Club. In addition to informing the clubs about products and services the weather service provides, meteorologists offered demonstrations on how to find and use NWS products on the Internet. Outreach efforts have also been extended to the local Great Basin College's Career fair, the Elko Home and Garden Fair and the Winnemucca Red Cross Safety Fair. In a continuing effort to establish open lines of communication and public education to some of the area's largest interests, the next community outreach event will be the Elko Mining Expo.

From contacts gained at these functions as well as other outreach efforts, NWS Elko has been strongly encouraging office tours which have been given to diverse groups, from boy scouts to Hotshot Fire Crews. Children visiting the office have been especially impressed by in-house demonstrations of a tornado simulated in a water bottle and wind and pressure experiments.

The Citizen Weather Observing Program

By: Jeff Savadel
(Warning Coordination Meteorologist)

Weather observations are a critical component of the information meteorologists need to create forecasts. Unfortunately, large areas of central and northern Nevada lack weather observing equipment. This lack of data poses particular problems to forecasters, since there can be huge changes in weather over very short distances due to the complex terrain of our region.

The Citizen Weather Observing Program (CWOP), a public-private partnership, allows citizens with weather stations and Internet access (or Ham radios) to send their weather data through a network that ultimately arrives at our National Weather Service forecast office in Elko. CWOP complements the Cooperative Observer and Skywarn Spotter programs. The weather data sent in through CWOP are quality controlled by the Forecast Systems Laboratory and can be easily displayed with other types of data (e.g., radar, satellite, etc.) on our workstations.

The end result of additional weather observations from a program such as CWOP is improved weather forecasts and warnings. By helping the forecasters see what type of weather (e.g., winds, temperature, etc) is occurring in areas that currently lack observations, we will gain a better understanding of local weather and be able to more accurately predict future weather conditions. For more information on CWOP and directions on how to join this program go to: http://www.wxqa.com/ or contact Jeff Savadel (Warning Coordination Meteorologist) at 775-778-6716 or jeffrey.savadel@noaa.gov.

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